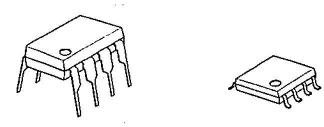
ULTRA-LOW OFFSET VOLTAGE, LOW DRIFT OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

The NJM OP-07 is ultra-low input offset voltage and bias current, low drift and high gain operational amplifier with internal frequency compensation.

The NJM OP-07 is suitable for a high accurated instrumental amplifier.

■ PACKAGE OUTLINE

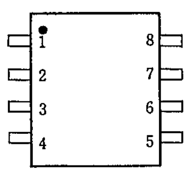


NJMOP-07D NJMOP-07M

■ FEATURES

- Ultra-Low V_{IO} — 60 μV
- Ultra-Low I_B — 1.8nA
- Ultra-Low Drift — unnull 0.5 μV/℃; null 0.4 μV/℃
- Ultra-Stable — 0.4 μV/M_o
- Wide Operting Voltage — ±3V ~ ±22V
- Package Outline — DIP8, DMP8
- Bipolar Technology

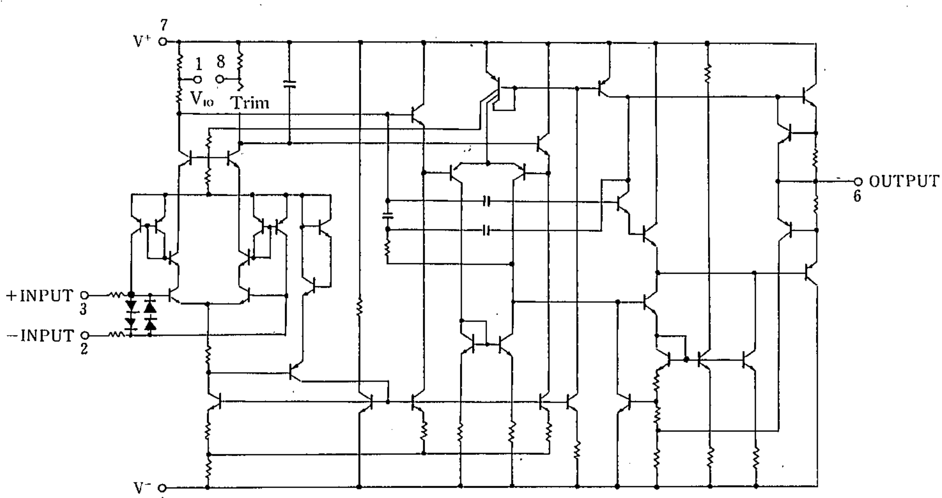
■ PIN CONFIGURATION



NJMOP-07D
NJMOP-07M

PIN FUNCTION
1. V_{IO} Trim
2. −INPUT
3. +INPUT
4. V^-
5. NC
6. OUTPUT
7. V^+
8. V_{IO} Trim

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+/V^-	±22	V
Input Voltage	V_I	±22(note 1)	V
Differential Input Voltage	V_{ID}	±30	V
Power Dissipation	P_D	(DIP8) 500	mW
		(DMP8) 300	mW
Storage Temperature Range	Tstg	−40∼+125	℃
Operating Temperature Range	Topr	−40∼+85	℃
Output Current		continuous	

(note) For supply voltage less than ±22V. the absolute maximum input voltage is equal to the supply voltage.

■ ELECTRICAL CHARACTERISTICS

(Ta =+25℃, V^+/V^-=±15V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}		—	60	150	μV
Long Term Stability		(note 1,2)	—	0.4	2	μV/Mo
Input Offset Current	I_{IO}		—	0.8	6	nA
Input Bias Current	I_B		—	±1.8	±7	nA
Open Loop Output Resistance	R_O	V_O=0, I_O=0	—	60	—	Ω
Input Resistance	R_{ID}	(Differential Mode)	8	33	—	MΩ
Input Resistance	R_{IC}	(Common Mode)	—	120	—	GΩ
Input Common Mode Voltage Range	V_{ICM}		±13	±14	—	V
Common Mode Rejection Ratio	CMR	V_{CM}=±13V	100	120	—	dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±3V∼±18V	90	104	—	dB
Large Signal Voltage Gain 1	AV_1	R_L≧2kΩ, V_O=±10V	101.5	112.0	—	dB
Large Signal Voltage Gain 2	AV_2	R_L=500Ω, V_O= ±0.5V, V^+/V^-=±3V	100.0	112.0	—	dB
Maximum Output Voltage 1	V_{OM1}	R_L≧10kΩ	±12	±13	—	V
Maximum Output Voltage 2	V_{OM2}	R_L>2kΩ	±11.5	±12.8	—	V
Maximum Output Voltage 3	V_{OM3}	R_L>1kΩ	—	±12	—	V
Slew Rate	SR	R_L≧2kΩ	—	0.17	—	V/μS
Unity Gain Bandwidth	f_T	A_{VCL}=1	—	0.5	—	MHz
Operating Current 1	I_{CC1}	V^+/V^-=±15V	—	2.7	5.0	mA
Operating Current 2	I_{CC2}	V^+/V^-=±3V	—	0.67	1.3	mA
Offset Adjustment Range		R_P=20kΩ	—	±4	—	mV
Equivalent Input Noise Voltage	V_{NI}	0.1Hz∼10Hz (note 2)	—	0.38	0.65	μ V_{P-P}
Equivalent Input Noise Voltage 1	e_n 1	f_O=10Hz (note 2)	—	10.5	20	nV/√Hz
Equivalent Input Noise Voltage 2	e_n 2	f_O=100Hz (note 2)	—	10.2	13.5	nV/√Hz
Equivalent Input Noise Voltage 3	e_n 3	f_O=1kHz (note 2)	—	9.8	11.5	nV/√Hz
Equivalent Input Noise Current	I_{NI}	0.1Hz∼10Hz (note 2)	—	15	35	pA_{P-P}
Equivalent Input Noise Current 1	i_n 1	f_O=10Hz (note 2)	—	0.35	0.9	pA/√Hz
Equivalent Input Noise Current 2	i_n 2	f_O=100Hz (note 2)	—	0.15	0.27	pA/√Hz
Equivalent Input Noise Current 3	i_n 3	f_O=1kHz (note 2)	—	0.13	0.18	pA/√Hz

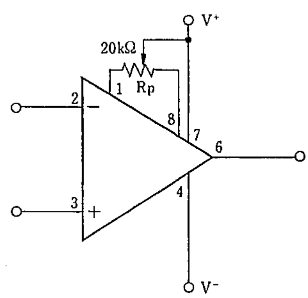
■ ELECTRICAL CHARACTERISTICS

(0℃≦Ta≦70℃, $V^+/V^-=\pm15V$)

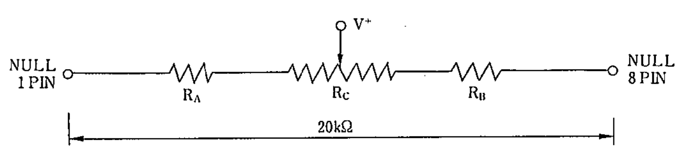
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}		—	85	250	μV
Average V_{IO} Drift (unnull)			—	0.5	1.8	μV/°C
Average V_{IO} Drift (null)		$R_P=20k\Omega$	—	0.4	1.6	μV/°C
Input Offset Current	I_{IO}		—	1.6	8	nA
Average I_{IO} Drift			—	12	50	pA/°C
Input Bias Current	I_{IB}		—	±2.2	±9	nA
Average I_{IB} Drift			—	18	50	pA/°C
Input Common Mode Voltage Range	V_{ICM}		±13	±13.5	—	V
Common Mode Rejection Ratio	CMR	$V_{CM}=\pm13V$	97	120	—	dB
Supply Voltage Rejection Ratio	SVR	$V^+/V^-=\pm3V\sim\pm8V$	86	120	—	dB
Voltage Gain	A_V	$R_L\geqq2k\Omega$, $V_O=\pm10V$	100	400	—	V/mV
Maximum Output Voltage	V_{OM}	$R_L\geqq2k\Omega$	±11	±12.6	—	V

(note 1) Long Term Stability refers to the average trend line of V_{IO} vs. time over extended periods after the first 30 days of operation.
(note 2) According to the evaluation by NJRC, more than 90% of all these products can be guaranteed.

■ OFFSET ADJUSTMENT METHOD



For making low sensitivity of change in the input offset voltage against resistance regulation of potentiometer (Easy case of offset adjustment)

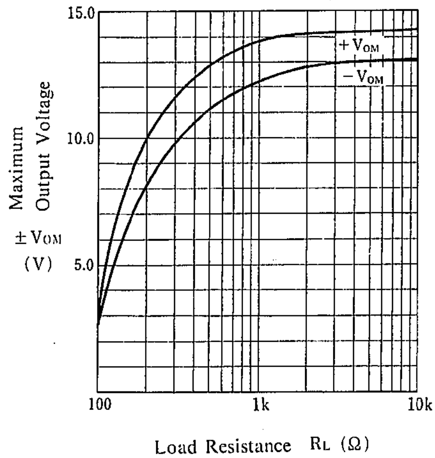


※R_A, R_B Fixed 7.5kΩ, R_C adjustable 5.0kΩ
※R_A, R_B, R_C are metalfilm resisters, RC is more than 10 times winding.

■ TYPICAL CHARACTERISTICS

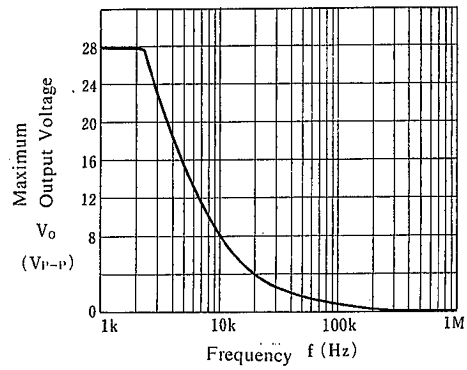
Maximum Output Voltage vs. Load Resistance

($V^+/V^- = \pm15V$, $V_{in} = \pm10mV$, $Ta = 25°C$)



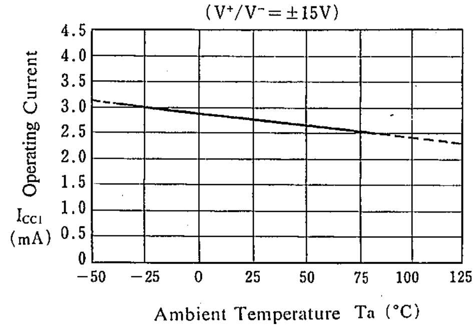
Maximum Output Voltage Swing vs. Frequency

($V^+/V^- = \pm15V$, $Ta = 25°C$)



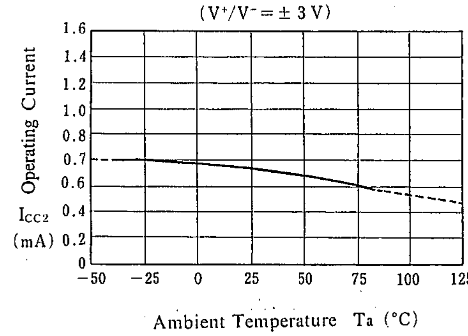
Operating Current vs. Temperature

($V^+/V^- = \pm15V$)



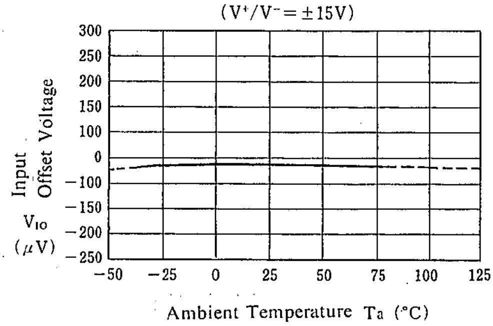
Operating current vs. Temperature

($V^+/V^- = \pm3V$)



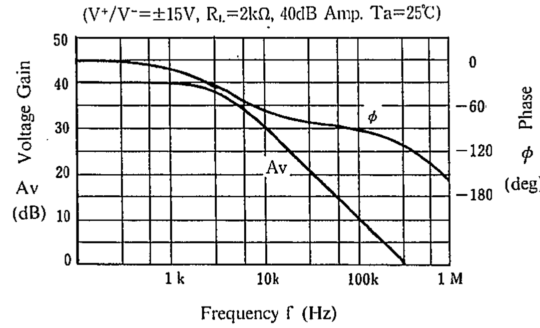
Input Offset Voltage vs. Temperature

($V^+/V^- = \pm15V$)



Voltage Gain, Phase vs. Frequency

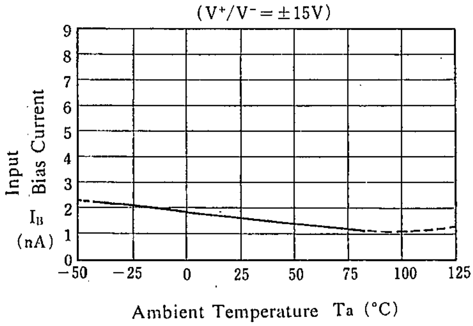
($V^+/V^- = \pm15V$, $R_L = 2k\Omega$, 40dB Amp. $Ta = 25°C$)



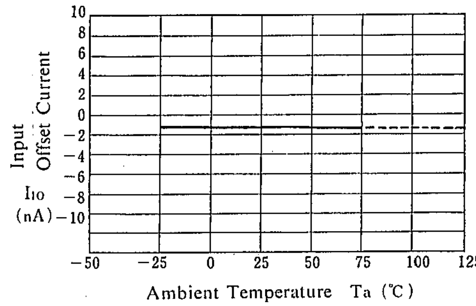
■ **TYPICAL CHARACTERISTICS**

Input Bias Current vs. Temperature

($V^+/V^- = \pm15V$)

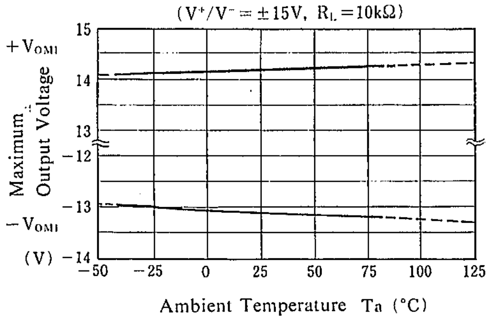


Input Offset Current vs. Temperarure



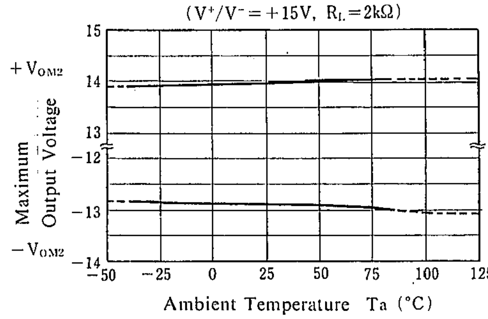
Maximum Output Voltage vs. Temperature

($V^+/V^- = \pm15V$, $R_L = 10k\Omega$)



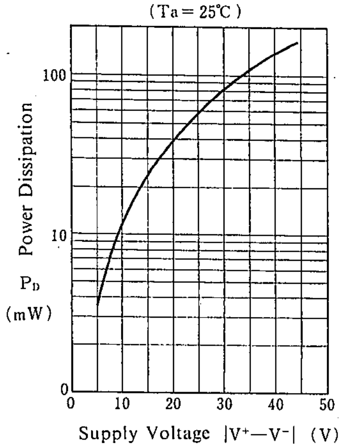
Maximum Output Voltage vs. Temperature

($V^+/V^- = +15V$, $R_L = 2k\Omega$)



Power Dissipation vs. Supply Voltage

($Ta = 25℃$)



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